

Application No. 10/743,389
Amendment dated June 27, 2006
Reply to Office Action of February 27, 2006

Docket No.: 21581-00310-US

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A chemical conversion coating agent comprising:
at least one kind selected from the group consisting of zirconium, titanium and hafnium;
fluorine; and
a water-soluble epoxy compound containing an isocyanate group ~~and/or a melamine group~~,
wherein a content of the at least one kind selected from the group consisting of zirconium, titanium and hafnium in the chemical conversion coating agent is 20 to 10000 ppm in terms of metal, and
a content of the water-soluble epoxy compound containing the isocyanate group ~~and/or the melamine group~~ in the chemical conversion coating agent is 5 to 5000 ppm as a concentration of solid matter.
2. (Currently Amended) A chemical conversion coating agent ~~consisting of~~ comprising:
at least one kind selected from the group consisting of zirconium, titanium and hafnium;
fluorine;
water-soluble epoxy compound; and
polyisocyanate compound and/or a melamine resin,
wherein a content of the at least one kind selected from the group consisting of zirconium, titanium and hafnium in the chemical conversion coating agent is 20 to 10000 ppm in terms of metal, and
a total amount of the water-soluble epoxy compound and the polyisocyanate compound and/or the melamine resin in the chemical conversion coating agent is 5 to 5000 ppm as a concentration of solid matter,
wherein said chemical conversion coating agent further contains
1 to 5000 ppm of at least one kind of a chemical conversion reaction accelerator selected from the group consisting of nitrite ions, nitro group-containing compounds, hydroxylamine

Application No. 10/743,389

Docket No.: 21581-00310-US

Amendment dated June 27, 2006

Reply to Office Action of February 27, 2006

sulfate, persulfate ions, sulfite ions, hyposulfite ions, peroxides, iron (III) ions, citric acid iron compounds, bromate ions, perchlorinate ions, chlorate ions, chlorite ions, ascorbic acid, citric acid, tartaric acid, malonic acid, succinic acid and salts thereof.

3. (Previously Presented) The chemical conversion coating agent according to claim 1, wherein the water-soluble epoxy compound has an amino group.
4. (Canceled)
5. (Canceled)
6. (Canceled)
7. (Previously Presented) The chemical conversion coating agent according to claim 1, wherein a pH thereof is 1.5 to 6.5.
8. (Previously Presented) A surface-treated metal having a chemical conversion coat formed by the chemical conversion coating agent according to claim 1.
9. (Original) The surface-treated metal according to Claim 8, wherein the chemical conversion coat has a coat amount of 0. 1 to 500 mg/m² in sum of a total amount of metals contained in the chemical conversion coating agent and carbon contained in the water-soluble epoxy compound.
10. (Previously Presented) The surface-treated metal according to claim 8, wherein a substance to be treated comprises an iron material, a zinc material and/or an aluminum material.
11. (Previously Presented) The chemical conversion coating agent according to claim 2, wherein the water-soluble epoxy compound has an amino group.
12. (Canceled)

Application No. 10/743,389

Docket No.: 21581-00310-US

Amendment dated June 27, 2006

Reply to Office Action of February 27, 2006

13. (Currently Amended) The chemical conversion coating agent according to claim 3, containing

1 to 5000 ppm of at least one kind of a chemical conversion reaction accelerator selected from the group consisting of nitrite ions, nitro group-containing compounds, hydroxylamine sulfate, persulfate ions, sulfite ions, hyposulfite ions, peroxides, iron (III) ions, citric acid iron compounds, bromate ions, perchlorinate ions, chlorate ions, chlorite ions as well as ascorbic acid, citric acid, tartaric acid, malonic acid, succinic acid and salts thereof.

14. (Currently Amended) ~~A~~ The chemical conversion coating agent according to ~~claim 2~~, ~~containing consisting of:~~

at least one kind selected from the group consisting of zirconium, titanium and hafnium;

fluorine;

a water-soluble epoxy compound; and

polyisocyanate compound and/or a melamine resin,

wherein a content of the at least one kind selected from the group consisting of zirconium, titanium and hafnium in the chemical conversion coating agent is 20 to 10000 ppm in terms of metal, and

a total amount of the water-soluble epoxy compound and the polyisocyanate compound and/or the melamine resin in the chemical conversion coating agent is 5 to 5000 ppm as a concentration of solid matter,

wherein said chemical conversion coating agent further contains

1 to 5000 ppm of at least one kind of a chemical conversion reaction accelerator selected from the group consisting of nitrite ions, nitro group-containing compounds, hydroxylamine sulfate, persulfate ions, sulfite ions, hyposulfite ions, peroxides, iron (III) ions, citric acid iron compounds, bromate ions, perchlorinate ions, chlorate ions, chlorite ions as well as ascorbic acid, citric acid, tartaric acid, malonic acid, succinic acid and salts thereof, and

at least one kind selected from the group consisting of: at least one kind of metal ions (A) selected from the group consisting of zinc ions, magnesium ions, calcium ions, aluminum ions, manganese ions and iron ions; copper ions (B); and a silicon-containing compound (C).

Application No. 10/743,389

Docket No.: 21581-00310-US

Amendment dated June 27, 2006

Reply to Office Action of February 27, 2006

15. (Previously Presented) The chemical conversion coating agent according to claim 3, containing

at least one kind selected from the group consisting of: at least one kind of metal ions (A) selected from the group consisting of zinc ions, magnesium ions, calcium ions, aluminum ions, manganese ions and iron ions; copper ions (B); and a silicon-containing compound (C).

16. (Canceled)

17. (Currently Amended) ~~A~~ The chemical conversion coating agent ~~according to claim 14,~~ containing consisting of:

at least one kind selected from the group consisting of zirconium, titanium and hafnium; fluorine;

a water-soluble epoxy compound; and

polyisocyanate compound and/or a melamine resin,

wherein a content of the at least one kind selected from the group consisting of zirconium, titanium and hafnium, in the chemical conversion coating agent is 20 to 10000 ppm in terms of metal, and
a total amount of the water-soluble epoxy compound and the polyisocyanate compound and/or the melamine resin in the chemical conversion coating agent is 5 to 5000 ppm, as a concentration of solid matter,

wherein said chemical conversion coating agent further contains

1 to 5000 ppm of at least one kind of a chemical conversion reaction accelerator selected from the group consisting of nitrite ions, nitro group-containing compounds, hydroxylamine sulfate, persulfate ions, sulfite ions, hyposulfite ions, peroxides, iron (III) ions, citric acid iron compounds, bromate ions, perchlorinate ions, chlorate ions, chlorite ions as well as ascorbic acid, citric acid, tartaric acid, malonic acid, succinic acid and salts thereof, and at least one kind selected from the group consisting of:

at least one kind of metal ions (A) selected from the group consisting of zinc ions, magnesium ions, calcium ions, aluminum ions, manganese ions and iron ions; copper ions (B); and a silicon-containing compound (C),

Application No. 10/743,389
Amendment dated June 27, 2006
Reply to Office Action of February 27, 2006

Docket No.: 21581-00310-US

wherein the silicon-containing compound (C) is at least one kind selected from the group consisting of silica, water-soluble silicate compounds, esters of silicic acid, alkyl silicates and silane coupling agents.

18. (Previously Presented) The chemical conversion coating agent according to claim 15, wherein the silicon-containing compound (C) is at least one kind selected from the group consisting of silica, water-soluble silicate compounds, esters of silicic acid, alkyl silicates and silane coupling agents.

19. (Canceled)

20. (Canceled)

21. (Currently Amended) A chemical conversion coating agent, containing no chromium, consisting of comprising:

at least one member selected from the group consisting of zirconium, titanium and hafnium;

fluorine;

a water-soluble epoxy compound; and a polyisocyanate compound and/or a melamine resin,

wherein a content of the at least one member selected from the group consisting of zirconium, titanium and hafnium in the chemical conversion coating agent is 20 to 10000 ppm in terms of metal, and

a total amount of the water-soluble epoxy compound and the polyisocyanate compound and/or the melamine resin in the chemical conversion coating agent is 5 to 5000 ppm as a concentration of solid matter,

wherein said chemical conversion coating agent further contains

at least one member selected from the group consisting of: at least one kind of metal ions (A) selected from the group consisting of zinc ions, magnesium ions, calcium ions, aluminum ions, manganese ions and iron ions; copper ions (B); and a silicon-containing compound (C), and

Application No. 10/743,389

Docket No.: 21581-00310-US

Amendment dated June 27, 2006

Reply to Office Action of February 27, 2006

said silicon-containing compound (C) being at least one member selected from the group consisting of silica, water-soluble silicate compounds, esters of silicic acid, alkyl silicates and silane coupling agents.

22. (New) A method of treating a metal surface with the chemical conversion coating agent according to claim 1 which comprises:

bringing said chemical conversion coating agent into contact with said metal surface, and

wherein phosphorous is substantially not used in said method of treating a metal surface.

23. (New) A method of treating a metal surface with the chemical conversion coating agent according to claim 2 which comprises:

bringing said chemical conversion coating agent into contact with said metal surface, and

wherein phosphorous is substantially not used in said method of treating a metal surface.

24. (New) A method of treating a metal surface with the chemical conversion coating agent according to claim 14 which comprises:

bringing said chemical conversion coating agent into contact with said metal surface, and

wherein phosphorous is substantially not used in said method of treating a metal surface.

25. (New) A method of treating a metal surface with the chemical conversion coating agent according to claim 17 which comprises:

bringing said chemical conversion coating agent into contact with said metal surface, and

wherein phosphorous is substantially not used in said method of treating a metal surface.

Application No. 10/743,389

Docket No.: 21581-00310-US

Amendment dated June 27, 2006

Reply to Office Action of February 27, 2006

26. (New) A method of treating a metal surface with the chemical conversion coating agent according to claim 21 which comprises:
- bringing said chemical conversion coating agent into contact with said metal surface, and
 - wherein phosphorous is substantially not used in said method of treating a metal surface.